

**REMARKS**

**112 Rejection** - On page 6 of the Final Rejection in the parent application, the Examiner rejected claims 78-110 under 35 U.S.C. §112, first paragraph as being based on subject matter not disclosed in the specification. Specifically, the Examiner contends that the specification does not teach storing a set of pre-existing appliances or storing a set of orthodontic appliances.

**Applicant's Argument Previously Presented** - The Examiner's attention is directed to page 12, line 20 through page 13, line 3 which discloses that "[t]his display may be used to facilitate the initial selection of a prescription, brackets, archwires, ligatures, and/or other orthodontic appliances by the orthodontist in accordance with the orthodontist's proposed orthodontic treatment to achieve the desired results. These initial selections are entered and stored in the memory system 16 at a block 114." (Emphasis added.)

Accordingly, the application expressly states that a set of orthodontic applicants is stored.

The Examiner's attention is next directed to page 13, lines 6-21 which disclose that ". . . the

program 100 at the block 114 may instead be arranged to make the initial prescription and appliance selections automatically by comparing the pretreatment model entered at the blocks 106, 108, and/or 110 to treatment data stored in the memory system 16. This treatment data, for example, may be in the form of a look up table or other data structure containing past pre-treatment models and the corresponding orthodontic treatment strategies which were used to successfully treat the patients from whom the past pre-treatment models were derived. Thus, the current patient's pre-treatment model may be used as an address into the memory system 16 in order to read out the treatment strategy corresponding to this address. Extrapolation can be used in the case where a patient's pre-treatment model is not an exact match with the stored pre-treatment models."

According to this portion of the present application, appliance selections can be made automatically based on a look up table or other data structure stored in memory. It is implicit that, in order to make such appliance selections automatically, the stored look up table or other data structures must

include a set appliances so that appliances may be selected automatically.

The Examiner's attention is further directed to page 22, lines 11-17 which discloses that ". . . the blocks 134 and 136 may be executed manually or they may be executed automatically by comparing the calculated stresses, strains, forces, friction, and/or moments to acceptable or desired ranges and by selecting appliances targeted to bring any errant stresses, strains, forces, friction, and/or moments within the desired and/or acceptable ranges."

Thus, the present application teaches that appliances may be automatically selected, which means that they must be stored to be automatically selected.

Finally, claim 27 as originally filed included the storing of a set of orthodontic appliances as item c). The original claims are, of course, part of the as-filed disclosure.

Thus, the original disclosure of the present application fully teaches storing a set of appliances or storing a set of orthodontic appliances.

For this reason, claims 78-110 are fully supported by the original disclosure of the present

application so that no new matter was introduced by these claims.

**Examiner's Response in Advisory Action and Applicant's Rebuttal Thereto** - The Examiner asserts that two of the application passages cited by applicant merely relate to storing appliances and do not specify that pre-existing (set of) appliances are stored so that a subset of appliances can be selected from the set of stored appliances. These passages augment the other passages cited by applicants so that all of the cited passages taken together fairly suggest and teach the storing of a set of appliances so that a subset of appliances can be selected from the stored set of appliances.

The Examiner further asserts that the passages cited by applicant relating to automatic appliance selection do not suggest and teach storing a set of pre-existing appliances because it is necessary to store only prescription parameters from which the computer can derive the desired shape of the appliances. However, these passages discuss appliance selection, not appliance fabrication. It may very well be that at least some claims of the present application cover a process that includes appliance fabrication. However, with regard to

the cited passages, automatic selection as a minimum implies the storing of a set of pre-existing appliances so that subsets of the appliances can be automatically selected. Therefore, the automatic selection of appliances suggests that the appliances are stored in memory so that automatic selection is feasible.

The Examiner also argues that, because a set of prescription parameters do not imply a specific appliance, a set of pre-existing appliances is not implicit from the disclosure of automatic appliance selections. However, applicant has not argued that a set of prescription parameters implies a specific appliance. Applicant instead argues that automatic appliance selection itself implies a stored set of pre-existing appliances.

Moreover, it is noted that independent claim 70 does not necessarily require that a set of pre-existing appliances be stored. Independent claim 70 merely recites the storing in the memory of a proposed subset of orthodontic appliances from a set of pre-existing orthodontic appliances according to a proposed orthodontic treatment and the storing in the memory of a new subset of orthodontic appliances from the set of pre-

existing orthodontic appliances if a finite element analysis indicates that the proposed orthodontic treatment produces undesired effects.

The present application discloses that appliances are selected. Appliances cannot be selected if they do not pre-exist.

**Art Rejection** - On page 2 of the Office Action in the parent application, the Examiner rejected previous claims 58, 60, 64, and 66 (now claims 50, 52, 56, and 58) under 35 U.S.C. §103(a) as being unpatentable over the Chishti '511 patent in view of the Chishti '893 patent.

**Applicant's Argument Previously Presented** - Independent claim 50 (previous independent claim 58) recites that the original positions of a patient's teeth are stored in memory, that the desired final positions of the patient's teeth are stored in the memory, and that a finite element analysis is performed based on the orthodontic treatment and a movement of the patient's teeth between only the stored original and final positions.

As the Examiner has recognized, the Chishti '511 patent does not disclose performing a finite element analysis based on a movement of the patient's teeth

between only stored original and final positions.

Therefore, the Examiner has cited the Chishti '893 patent.

The Chishti '893 patent, like the Chishti '511 patent, discloses positioning a patient's teeth in a plurality of stages using a plurality of intermediate stages between the original and final positions of the patient's teeth.

The Examiner, however, then asserts that the gap between independent claim 50 and the Chishti '511 patent is filled in by the Chishti '893 patent because the Chishti '893 patent discloses at column 5, lines 1-7 that, in those cases where patients' teeth are responding very quickly, one or more intermediate appliances may be skipped so that the number of appliances is reduced below the number determined at the outset.

This portion of the Chishti '893 patent does not disclose or suggest that the initial and all intermediate appliances can be eliminated and that a single final appliance can be used to move a patient's teeth from their original positions to their final positions. Indeed, the Chishti '893 patent teaches that at least one intermediate appliance in addition to an

initial appliance and a final appliance are used. For example, the Chishti '893 patent in column 3, lines 31-45 states that at least a first (initial) appliance repositions a patient's teeth from the initial tooth arrangement to a first intermediate arrangement, at least one intermediate appliance repositions the teeth from the first intermediate arrangement to one or more successive intermediate arrangements, and a final appliance repositions the teeth from the last intermediate arrangement to the desired final tooth arrangement.

Therefore, the Chishti '893 patent does not suggest performing the finite element analysis disclosed in the Chishti '511 patent based on a movement of the patient's teeth between only the original and final positions.

Because the Chishti '893 patent does not suggest performing the finite element analysis disclosed in the Chishti '511 patent based on a movement of the patient's teeth between only the original and final positions, independent claim 50 of the present application is not unpatentable over the Chishti '511 patent in view of the Chishti '893 patent.



**Examiner's Response in Advisory Action and**

**Applicant's Rebuttal Thereto** - With regard to independent claim 50, the Examiner asserts that applicant does not disclose any criticality in dispensing with the use of intermediate appliances and that, therefore, to not use an intermediate appliance would have been obvious.

However, the test of obviousness is not whether applicant suggests non-obviousness, but whether the prior art suggests obviousness to one of ordinary skill in the art. As pointed out above, the prior art cited by the Examiner, i.e., the Chishti '893 patent and the Chishti '511 patent, do not suggest, to one of ordinary skill in the art, performing the finite element analysis based on a movement of the patient's teeth between only original and final positions of a patient's teeth.

Accordingly, independent claim 50 of the present application is not unpatentable over the Chishti '511 patent in view of the Chishti '893 patent.

**Art Rejection** - On page 3 of the Office Action in the parent application, the Examiner rejected previous claims 68, 72, 74, and 76 under 35 U.S.C. §103(a) as being unpatentable over the Chishti '511 patent in view of the Murakami patent.

**Applicant's Argument Previously Presented -**

Independent claim 60 (previous independent claim 68) recites that the finite element analysis is performed based on contact pairs between orthodontic appliances or between orthodontic appliances and teeth to be applied during the orthodontic treatment. As the Examiner has recognized, there is no disclosure in the Chishti '511 patent of performing a finite element analysis based on contact pairs between orthodontic appliances or between orthodontic appliances and teeth to be applied during the orthodontic treatment. Indeed, the Chishti '511 patent does not disclose contact pairs at all.

Therefore, the Examiner has relied on the Murakami patent.

The Murakami patent discloses that the stress distribution on an elastic body from a temperature variation pattern on a surface of the elastic body can be found by adiabatically applying stress variations to the elastic body, detecting a temperature variation pattern created by the thermoelastic effect, finding sums of principal stresses at points located inside the surface of the body from the detected temperature variation pattern, preparing a model of a structure having the same

shape as the body, establishing free nodal points at a boundary of the body, applying a unit of external force to certain ones of the free nodal points and finding the sums of the principal stresses at the points located inside the surface of the body by a numerical analysis such as the finite element analysis, then finding the distribution of the external force applied to the free nodal points which provides a principal stress sum distribution closest to the actually measured distribution of the principal stress sums using the principle of superposition and the least squares method, and finding stress components acting on arbitrary points on or in the actual body by numerical analysis from the found distribution of the external force.

The Examiner points to column 5, lines 42-55 of the Murakami patent for a disclosure of using contact pairs during a finite element analysis. This portion of the Murakami patent discloses that the stress distribution on and in an object is determined by first detecting the pattern of the temperature variation on the surface of the actual object, by summing the principal stresses on the surface of the actual object, by entering the coordinates of the contact points, constraint

conditions, and elastic constants which are necessary for a numerical analysis of the stresses in a model having the same shape as the actual object for which the principal stress sums have been found, by entering the coordinates of the points on which the external forces act, by entering the principal stress sums, by using a numerical analysis to find the principal stress sums when the external force is applied to certain of the free nodal points while one or two arbitrary nodes of the boundary are constrained, and by finding the correct value of the force acting on the nodal point of each constrained portion.

The Murakami patent does not define the nature of the contact points, and does not disclose any contact pairs even remotely similar to those recited in independent claim 60. Therefore, even the skilled artisan would not understand the Murakami patent to suggest a modification of the finite element analysis disclosed in the Chishti '511 patent so that the finite element analysis is performed based on contact pairs between orthodontic appliances or between orthodontic appliances and teeth.

Because the Murakami patent does not suggest a modification of the finite element analysis disclosed in the Chishti '511 patent so that the finite element analysis is performed based on contact pairs between orthodontic appliances or between orthodontic appliances and teeth, independent claim 60 of the present application is not unpatentable over the Chishti '511 patent in view of the Murakami patent.

**Examiner's Response in Advisory Action and Applicant's Rebuttal Thereto** - The Examiner asserts that contact points must include at least two elements in contact and that, therefore, it is an obvious matter of choice to use pairs to form the contact points in the finite element analysis of contact forces.

However, the Murakami patent does not disclose or suggest any particular use for the elastic body whose stress distribution is being determined. Therefore, the Murakami patent does not suggest that contact points may or could mean contact pairs between orthodontic appliances or between orthodontic appliances and teeth.

Moreover, the Examiner asserts that contact points must mean contact pairs. However, contact points do not necessarily mean contact pairs. Indeed, the

Murakami patent discloses finding the stress distribution on and in an elastic body from a temperature variation pattern on the surface of the elastic body. Therefore, the temperature variation must be measured. Accordingly, the contact points could be points at which temperature sensing is applied to the elastic body to sense the temperature variations.

The Murakami patent even provides some support for this interpretation when it discloses in the same paragraph that "[a]lso, the coordinates on which the external forces  $P(i)$  act are entered."

Therefore, as can be seen, it is not an obvious matter of choice to use pairs to form the contact points in the finite element analysis of contact forces. Accordingly, independent claim 60 of the present application is not unpatentable over the Chishti '511 patent in view of the Murakami patent.

**Art Rejection** - On page 4 of the Office Action in the parent application, the Examiner rejected previous claims 78-81, 83-92, 94, 96-102, 104-106, 108, and 110 under 35 U.S.C. §103(a) as being unpatentable over the Chishti '511 patent in view of the Chishti published application.

**Applicant's Argument Previously Presented -**

Independent claim 70 (previous independent claim 78) requires storing a proposed subset of a set of pre-existing orthodontic appliances according to a proposed orthodontic treatment, performing a finite element analysis based on the proposed orthodontic treatment, storing a new subset of the set of pre-existing orthodontic appliances if the finite element analysis indicates that the proposed orthodontic treatment produces undesired effects, and repeating the finite element analysis.

As noted by the Examiner, the Chishti '511 patent does not disclose storing a set of pre-existing appliances and testing subsets of the appliances with a finite element analysis to determine which subset will provide an effective orthodontic treatment.

Accordingly, the Examiner relies on the Chishti published application, citing paragraph 0141 in particular.

The Chishti published application discloses that a polymeric appliance (shown in Figure 1C) may be used to reposition a patient's teeth, that no attachments, such as wires and brackets, are typically

provided for holding the polymeric appliance in place over the teeth, and that in some cases, however, it may be necessary to provide individual attachments on the teeth within corresponding receptacles or apertures in the polymeric appliance so that the polymeric appliance can apply forces that would not be possible in the absence of such attachments.

Paragraph 0141 of the Chishti published application discloses that attachment models can be created to analyze the effects of the attachments, that many attachments, such as conventional brackets, are available in standard shapes and sizes, that these attachments can be selected from a library of virtual appliances, that other attachments are patient-specific and require modeling, and that the presence of virtual attachments ensures that the polymeric appliances fabricated for the patient's treatment plan will accommodate the corresponding physical attachments placed in the patient's mouth during treatment.

The Chishti published application does not explicitly state that attachments are stored in a memory accessible by a computer executing a finite elements analysis. The Chishti published application merely



discloses that attachments can be selected from a library. Such disclosure is not suggestive of storing the attachments in a memory accessible by a computer executing a finite elements analysis, particularly considering that neither the Chishti '511 patent nor the Chishti published application discloses that the polymeric appliance itself is stored in memory. Thus, if neither the Chishti '511 patent nor the Chishti published application discloses that the polymeric appliance is stored in memory, then neither the Chishti '511 patent nor the Chishti published application suggests storing either the polymeric appliance or the attachments in memory.

Because neither the Chishti '511 patent nor the Chishti published application suggests storing either the polymeric appliance or the attachments in memory, independent claim 70 of the present application is not unpatentable over the Chishti '511 patent in view of the Chishti published application.

Independent claim 89 (previous independent claim 97) recites that a set of orthodontic appliances is stored, that a subset of the stored set of orthodontic appliances is applied to the patient's teeth according to

one of first and second position models, and that a finite element analysis is performed based on the first position model, the second position model, and the applied subset of orthodontic appliances.

As noted by the Examiner, the Chishti '511 patent does not disclose that a set of appliances is stored and that a subset of stored appliances as applied to the patient's teeth is tested with a finite element analysis.

Accordingly, the Examiner relies on the Chishti published application citing paragraph 0141 in particular.

As discussed above, the Chishti published application patent does not explicitly state that attachments are stored in a memory accessible by a computer executing a finite element analysis. The Chishti published application merely discloses that attachments can be selected from a library. Such disclosure is not suggestive of storing the attachments in a memory accessible by a computer executing a finite elements analysis, particularly considering that neither the Chishti '511 patent nor the Chishti published application discloses that the polymeric appliance itself

is stored in memory. Thus, if neither the Chishti '511 patent nor the Chishti published application discloses that the polymeric appliance is stored in memory, then neither the Chishti '511 patent nor the Chishti published application suggests storing either the polymeric appliance or the attachments in memory.

Because neither the Chishti '511 patent nor the Chishti published application suggests storing either the polymeric appliance or the attachments in memory, independent claim 89 of the present application is not unpatentable over the Chishti '511 patent in view of the Chishti published application.

**Examiner's Response in Advisory Action and Applicant's Rebuttal Thereto** - The Examiner did not respond to applicant's arguments with respect to independent claims 70 and 89.

Because independent claims 50, 60, 70, and 89 are patentable over the art applied by the Examiner, dependent claims 51-59, 61-69, 71-88, and 90-102 are likewise patentable over the art applied by the Examiner.


CONCLUSION

In view of the above, the claims of the present application patentably distinguish over the art applied by the Examiner. Accordingly, allowance of these claims and issuance of the present application are respectfully requested.

Respectfully submitted,

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